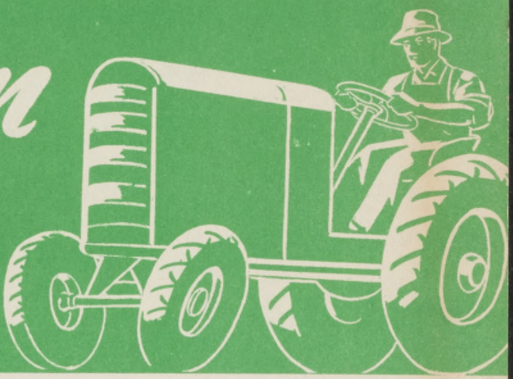
Occupational Health Bulletin



STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC HEALTH
BUREAU OF ADULT HEALTH

2151 Berkeley Way, Berkeley 4, California

Occupational Health Bulletin V

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PROTECTIVE MEASURES FOR USERS OF ORGANIC PHOSPHATE INSECTICIDES

In California agriculture, parathion, tetraethyl pyrophosphate (TEPP) and demeton (Systox) are at present the most widely used of the highly toxic organic phosphate insecticides. It has been well demonstrated that these economically important chemicals can be used safely when proper precautions are employed. However, serious poisoning and even death have resulted when these insecticides were used carelessly.

Organic phosphate insecticides can be readily taken into the body through the skin without the individual being aware of it. Breathing the dusts and sprays, or allowing contaminated food, water or cigarettes to reach the mouth can also introduce these substances into the body where it takes only small amounts to cause poisoning. Under certain circumstances the effects of repeated exposure to these chemicals can accumulate; that is, daily exposure to organic phosphate insecticides can build up to a critical point where symptoms of poisoning may appear suddenly after a very small exposure.

Persons who work with organic phosphate insecticides must know how to protect themselves. It is the employer's responsibility to educate his employees in the hazards involved in their job and to assure them that operation methods are keeping exposure to a minimum. Employees must be provided with equipment, facilities and the personal protection necessary for their safety. It is strongly recommended that continuous medical supervision be arranged for all persons who work regularly with these insecticides.

The purpose of this bulletin is to outline procedures and precautions which will assist the users of organic phosphate insecticides to operate within a good margin of safety. (For information concerning medical supervision of employees see bulletin listed at the end of this paper.)

OBSERVE SAFE PROCEDURES

Read the labels Regardless of the many trade names under which pesticides are marketed, the label on the original container will give the chemical or common name of the active ingredients and their concentrations. The label on the container will provide instructions and a statement of precautions for the use of the pesticide. This information should be carefully followed by anyone who uses pesticides.

The following are the chemical and common names of highly toxic organic phosphate insecticides which are used at present in California:

parathion	(diethyl p-nitrophenyl thionophosphate)
methyl parathion (metacide)	(dimethyl p-nitrophenyl thionophosphate)
TEPP	(tetraethyl pyrophosphate)
Systox (demeton)	(diethoxy thiophosphoric acid ester of 2-ethyl mercaptoethanol)
OMPA	(octamethyl pyro-phosphoramide)
EPN	(ethyl p-nitrophenyl thionobenzene phosphonate)

(Malathion, chlorthion and dipterix are examples of newly developed organic phosphates of a much lesser degree of toxicity than those listed above. Trithion is another new organic phosphate which possesses a moderate degree of toxicity. Phosdrin and thimet have also been recently introduced and are highly toxic.)

Avoid contamination of the work area The work area and equipment can be important sources of exposure if pesticide material is allowed to spill and accumulate. This is particularly true where concentrates are used. All mobile equipment such as spraying, dusting, and supply equipment should be rinsed with water from a hose after each day of use. Equipment should be thoroughly cleaned before any mechanical work is done.

Formulating Dry mixing should be done only in mechanically operated mixers. Ventilation hoods and ducts with sufficient indraft should be available at the dumping, transfer, and container filling openings. The exhaust ducts should discharge into effective filtering bags located in a place where room air contamination will not result from leakage from the filtering bags. Liquid insecticide in small batches can be made up by filling the tank first and emptying the opened end of the insecticide container under water. An accidental spill always calls for an immediate cleanup, with soap and water, preferably in an alkaline solution.

Loading When loading into the hopper the bags of organic phosphate dust should be cut open at the center with a knife, not torn open by hand. Dust should always be loaded from the up-wind side of the hopper. When loading liquid insecticide into a plane or ground tank, spills and drips must be avoided. The feed line control valve should be installed at the tank end of the hose so that the line will empty completely. Only leakproof dust hoppers should be used. Hopper covers for crop dusting airplanes should be made with lugs so that they remain locked in case of an accident to prevent dumping of hazardous cargo on the pilot.

Spraying or dusting With an air blast or boom sprayer, workers have the advantage of utilizing natural wind directions. Work should be done with the wind or when the wind is at minimum velocity. Where spray drift can occur protective clothing, goggles and respirators should be worn. The vehicle cab should be covered by a canopy. Ground or guide men should remain out of the drift of spray or dust.

Pruning, picking, and irrigating Fruit trees and other crops, where pruners, pickers, and irrigators can come in contact with considerable foliage in the course of their work, may be a source of exposure if the foliage has been treated recently with certain organic phosphates, such as parathion, which may remain on foliage for several weeks, depending on weather and other conditions. TEPP, on the other hand, disappears rather quickly and is not so likely to pose this kind of a problem to field workers.

Where skin contact with freshly treated foliage is likely to occur, workers should postpone their tasks or wear protective clothing, gloves, and whatever other gear is necessary to prevent direct contact of the skin with the foliage. After work, a shower and a change to clean clothing is very important.

Disposal of containers Emptied containers should be destroyed as soon as possible. If combustible, they should be burned in a perforated drum. Inhalation of the smoke should be avoided. Metal containers should be washed after using and if non-returnable they should be crushed or punctured and buried. Used containers must not be left where children can reach them.

Storage and transport All containers of organic phosphate insecticides must be stored under lock and key in separate quarters which are away from living and working areas and stored foods. Bags of dust or spray equipment containing organic phosphates should not be left unattended in the field. Truck drivers and others responsible for transporting organic phosphate insecticides must be aware of the manufacturer's specifications for decontamination, should a container become damaged or in case of a traffic accident.

Fire departments in some areas require notification of the locations of storage areas where hazardous chemicals are kept. There may be local ordinances, too, concerning the storage of these materials.

PERSONAL PROTECTION

If a worker has to rely solely on personal protective equipment, it would require, in many instances, that he wear a heavy impervious suit with gloves, boots, hat, goggles, and an approved respirator. This kind of protection is cumbersome and can be hazardous in hot weather because of the danger of heat stroke. The amount of protective gear which a worker should wear depends upon the kind of work he does and the protection he can depend upon from his working equipment and methods of operation.

Protection of the skin In most instances, work with organic phosphate insecticides involves possible contact with the skin. When formulating, spraying or dusting, it is advisable to wear long-sleeved coveralls buttoned at the neck and wrists, a hat (neoprene may be necessary), gauntlet gloves of natural or synthetic rubber extending over the cuffs, and boots covered by the trouser legs. Persons, such as flagmen for crop dusting aircraft, who may be in contact with sprays or dusts, should also wear this type of protection.

Eye protection Very small amounts of organic phosphate spray or dust, particularly TEPP, getting into the eye can immediately reduce the ability to see properly. This is a direct local effect on the eye which can occur even when the amount of insecticide is not sufficient to cause poisoning. These chemicals are very readily absorbed through the tissues around the eye, however, and a drop or so of concentrated insecticide can first produce its effects upon the eye, and second, when taken into the body, produce symptoms of poisoning. Therefore, the wearing of well-fitting goggles is of extreme importance to all workers who operate vehicles or other mechanical equipment when there is any possibility of dusts, sprays or splashes of organic phosphate insecticide reaching the eye.

Respiratory protection The organic phosphate insecticides now in use either possess a low degree of volatility or are so readily hydrolized that the problem presented is usually not that of vapor or "gas" given off. Hazards are primarily from the breathing of dusts and sprays which can be avoided if careful work practices are utilized. An approved respirator with filter and cartridge, or a gas mask with an approved canister may be worn. The capacity of the cartridge or canister for positive control varies with the exposure time and the concentration of the insecticide. The cartridges will not protect against high concentrations of organic phosphates for more than 30 minutes, and protection by the canisters cannot be assured for more than 2 hours. With high humidity this protection decreases. Respirators must be washed and cleaned after each day's use.

Care of protective clothing There are practical problems arising out of the care of protective clothing and equipment which deserve particular attention. Personal protective equipment can become a source of exposure if it is not properly cleaned, handled or maintained.

In formulating and in some other operations it has been found that the hands are subject to the most skin exposure. It is important: (1) to select gloves which are least subject to impregnation with insecticide,* (2) to discard them when any abrasions or tears appear, and most important (3) to wash them thoroughly with soap and water before removing. The hands should always be washed before gloves are put on.

Outer clothing should be removed by folding the outside in, taking care not to shake it out. Handling only by the inside, the washable clothing can be placed in a laundry bag and dumped as-is into a washing machine. Ample soap and water will remove the insecticide. Where possible, arrangements should be made for laundering at the place of work. Contaminated clothing should not be brought in to the home where it can be a real danger to children or the person who does the laundering.

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*Natural or synthetic rubber gloves offer reasonably good protection. However, the physical properties of the insecticide, including the solvent, dust or other vehicle with which it is mixed may have bearing on which kind of rubber glove may be least subject to impregnation with insecticide.

Soap and water Soap and water are probably the most formidable and practical weapons available in the prevention of poisoning among persons who work with organic phosphate insecticides. Abundant use of soap and water, particularly when a mild alkali is added, destroys organic phosphate insecticides rapidly. Immediate and thorough washing has prevented poisoning when even fairly large amounts of insecticide have been spilled on the skin.

It is of utmost importance for persons working with these chemicals to have facilities available at work so they can shower and change into a complete set of clean clothes before going home. If drinking and wash water are not available in the field, it should be carried in contamination-proof containers on a service truck, so that immediate washing can be carried out should accidental contact occur.

Before eating, drinking or smoking, the hands and face should be thoroughly washed. Food, drinking water, and tobacco should not be placed where there is any danger of its contamination.

FIRST AID

Whenever a person working with phosphate insecticides has received a significant exposure, such as spilling concentrated material on skin or clothing, the contaminated clothing should be removed and the skin washed thoroughly. Even if there is no indication of poisoning, the person should be accompanied to a physician for examination and laboratory tests. Symptoms of poisoning are usually delayed for several hours after exposure to parathion and Systox. Symptoms appear more rapidly after exposure to TEPP. It is not safe to return to work until the physician so indicates.

Symptoms and signs of early organic phosphate poisoning usually include excessive fatigue, headache, weakness and nausea. Depending upon several factors, including the dose, the route by which it is taken into the body, and the particular insecticide involved, the following may be noted soon after or be delayed several hours: giddiness, abdominal cramps, blurred vision, a feeling of constriction in the chest, wheezing, profuse sweating, pin-point pupils, vomiting and diarrhea. In severe poisoning, mental confusion, frothing at the mouth, muscle twitching, inability to stand or walk, drowsiness, convulsions, inability to breathe and even death can follow unless adequate medical treatment is given.

Workers showing any signs and symptoms of possible poisoning, should be seen by a physician without delay. The most important first-aid measures are: removing contaminated clothing, washing contaminated skin with soap and water, and administering artificial respiration if difficulty in breathing is present. The label on the container of the insecticide should be taken to the physician

Whether or not atropine tablets should be made available to workers who use organic phosphate insecticides is a matter requiring the judgment of the physician who has agreed to take responsibility for their medical supervision. In a real emergency a poisoned person cannot take medication by mouth because of vomiting and other symptoms, and he needs atropine in much larger doses by injection, which only a physician can provide.

MEDICAL SUPERVISION

For workers who regularly handle the toxic organic phosphates it is advisable for their employer to obtain the services of a local physician for medical supervision. Medical supervision includes periodic examinations and laboratory tests which have proved useful in detecting increased absorption of organic phosphate chemicals before illness appears. Also, if serious poisoning does occur a physician who is well acquainted with the chemicals involved can provide prompt treatment which can be lifesaving. Medical supervision provides a valuable check on the efficiency of the operating methods and the personal protective devices which are used to prevent exposure.

ADDITIONAL INFORMATION

The Division of Industrial Safety of the State Department of Industrial Relations, 965 Mission Street, San Francisco 3, California, or the County Agricultural Commissioner, will supply bulletins on injurious organic phosphates which describe the legal regulations and requirements for all users of organic phosphate pesticides in California.

The following bulletins are available by writing to the Bureau of Adult Health, State Department of Public Health, 2151 Berkeley Way, Berkeley 4, California:

For employers:	A Guide for Employers on Medical Control of Organic Phosphate Pesticide Exposure in Employment
For laboratories:	Microelectrometric Method for Blood Cholinesterase Determinations
For physicians:	A Guide for Physicians on Medical Control of Organic Phosphate Pesticide Exposure in Employment Laboratories in California Prepared to Determine Blood Cholinesterase Activity

The local health department can provide information or assistance regarding occupational health problems arising out of the use of pesticides.

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